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We claim:

1. A thick, solid, transparent radiation sensitive device for monitoring radiation dose comprising at least one radiation sensitive material in a polymeric binder wherein said radiation sensitive material is capable of undergoing an observable change when contacted with radiation.

2. The thick, solid, transparent radiation sensitive device of claim 1 wherein said device comprises a molded polymer or casted polymer.

3. The thick, solid, transparent radiation sensitive device of claim 1 wherein said device has a shape selected from coating, film, fiber, rod, plaque, block, regular shape or irregular shape.

4. The thick, solid, transparent radiation sensitive device of claim 1 wherein said radiation is selected from UV, X-ray, gamma-ray, electrons, protons, alpha particles or neutron radiation.

5. The thick, solid, transparent radiation sensitive device of claim 1, wherein said radiation sensitive material comprises at least one material selected from a diacetylene; a radiochromic dye; a pH sensitive dye; a leuco dye; a carbinol dye and a radiation sensitive complex.

6. The thick, solid, transparent radiation sensitive device of claim 5 wherein said diacetylene comprises at least one compound selected from 2,4-hexadiyn-1,6-diol, 3,5-octadiyn-1,8-diol, 4,6-decadiyn-1,10-diol, 5,7-dodecadiyn-1,12-diol, tricos-10,12-diynoic acid, pentacos-10,12-diynoic acid, their derivatives, including 2,4-hexadiyn-1,6-bis (n-Hexylurethane); 2,4-hexadiyn-1,6-bis (n-pentylurethane); 2,4-hexadiyn-1-mono (n-pentylurethane)-6-mono (n-hexylurethane); 2,4-hexadiyn-1-mono (n-hexylurethane)-6-mono (phenyl acetate); 5,7-dodecadiyn-1,12-bis(n-butoxycarbonyl methylurethane) and co-crystallized mixtures thereof.

7. The thick, solid, transparent radiation sensitive device of claim 5 wherein said radiochromic dye is selected from fuschin cyanide, hexahydroxy ethyl violet cyanide, pararose aniline cyanide, a tetrazolium dye including blue tetrazolium, tetrazolium violet, triphenyl tetrazolium chloride or mixture thereof.

8. The thick, solid, transparent radiation sensitive device of claim 5 wherein said leuco dye is selected from leuco crystal violet, leuco malachite green or mixture thereof.

9. The thick, solid, transparent radiation sensitive device of claim 5 wherein said carbinol dye is selected from malachite green carbinol base and p-roseaniline base.

10. The thick, solid, transparent radiation sensitive device of claim 5 wherein said pH sensitive dye is selected from pentamethoxytriphenylmethanol, bromocresol purple, bromophenol blue or mixture thereof.

11. The thick, solid, transparent radiation sensitive device of claim 1 wherein said radiation sensitive material is a complex of ammonium iron citrate.

12. The thick, solid, transparent radiation sensitive device of claim 1 further comprising an activator.

13. The thick, solid, transparent radiation sensitive device of claim 12 wherein said activator is a halocarbon.

14. The thick, solid, transparent radiation sensitive device of claim 12 wherein said activator is a halonium or sulfonium compound.

15. The thick, solid, transparent radiation sensitive device of claim 13 wherein said halocarbon is selected from ethyl trichloroacetate, heptachloropropane, ethyltrichloroacetate, chloroacetic acid, chloropropionic acid, hexachlorocyclohexane, methyltrichloroacetimidate, trichloroacetic acid, trichloroacetamide, trichloro ethanol, trichloro methyl benzyl acetate, trichloro methyl propanol hydrate, trichloro propane, chlorinated polymers and oligomers or mixture thereof.

16. The thick, solid, transparent radiation sensitive device of claim 12 wherein said activator is selected from diphenyliodonium iodide, diphenyliodonium hexafluoroarsenate, diphenyliodonium chloride, trimethylsulfonium iodide, triphenylsulfonium hexafluoroantimonate or mixture thereof.

17. The thick, solid, transparent radiation sensitive device of claim 1 wherein said binder is a polymerized monomer or oligomer.

18. The thick, solid, transparent radiation sensitive device of claim 1 wherein said binder is a polymerized di or polyfunctional monomer or oligomer.

19. The thick, solid, transparent radiation sensitive device of claim 1 wherein said binder is a polymer prepared by polymerization of a monomer or oligomer by radical or cationic polymerization process using initiator.

20. The thick, solid, transparent radiation sensitive device of claim 17 wherein said monomer and oligomers is olefins, vinyls, acrylates, methylmethacrylate, styrene and acrylic acid, or oligomeric methylmethacrylate, methylacrylate or polypropylenedimethacrylate.

21. The thick, solid, transparent radiation sensitive device of claim 1 wherein said binder is a polymer prepared by initiating polymerization with UV and visible light.

22. The thick, solid, transparent radiation sensitive device of claim 1 wherein said binder is a reaction product of two monomers.

23. The thick, solid, transparent radiation sensitive device of claim 1 wherein said binder is a reaction product of one of diol with diisocyanate, diepoxide with primary amine, primary diamine or secondary diamine, or a diamine with a diisocyanate.

24. The thick, solid, transparent radiation sensitive device of claim 17 wherein said monomer is selected from hexamethylene diisocyanate, polyethylene glycol, polypropylene glycol.

25. The thick, solid, transparent radiation sensitive device of claim 1 wherein said binder is obtained by cooling a molten homopolymer, copolymer or graft copolymer.

26. The thick, solid, transparent radiation sensitive device of claim 1 wherein said binder comprises at least one of polyvinylacetate, polyethylene, polyethylene-co-polyacrylic acid, polystyrene, polymethylmethacrylate, polysilicones, polybutadiene, polyvinyl chloride, poly vinylidene chloride and polyepichlorohydrin.

27. The thick, solid, transparent radiation sensitive device of claim 1 further comprising a solvent.

28. The thick, solid, transparent radiation sensitive device of claim 27 wherein said solvent is a solvent for a radiation sensitive material.

29. The thick, solid, transparent radiation sensitive device of claim 28 wherein said solvent is a plasticizer for said binder.

30. The thick, solid, transparent radiation sensitive device of claim 28 wherein said solvent is chosen from butoxy-2-ethylstearate, butyrolactone, diethyl fumarate, dimethyl maleate, dimethylcarbonate, dioctyl phthalate, ethylene glycol dimethyl ether, ethyl salicylate, polyethylene glycol dimethylether, propylene carbonate, triacetin, benzyl ether, dodecyl-1,2-methyl pyrrolidone, ethoxyethylacetate, ethylene glycol diacetate, ethyltrichloroacetate, methylpyrrolidone, methyl sulfoxide, polyethylene glycols of different molecular weight, dimethylformamide, cyclohexane, p-dioxane, tetrahydrofuran, p-xylene and dioctylphthalate or dibutylphthalate.

31. The thick, solid, transparent radiation sensitive device of claim 1 further comprising a converter.

32. The thick, solid, transparent radiation sensitive device of claim 31 a wherein said converter is a radio/electron luminescence or fluorescence phosphor which emits UV light, or lower energy X-ray or electrons when contacted with high energy X-rays, gamma rays, or electrons.

33. The thick, solid, transparent radiation sensitive device of claim 1 wherein said device is self-supporting.

34. The thick, solid, transparent radiation sensitive device of claim 1 wherein said device is a self-supporting film, fiber, plaque, rod or block.

35. The thick, solid, transparent radiation sensitive device of claim 1 wherein said device has a thickness larger than 0.1 millimeter.

36. The thick, solid, transparent radiation sensitive device of claim 1 further comprising a mixture of monomer, oligomer, polymer, radiation sensitive material, activator, solvent and plasticizer.

37. The thick, solid, transparent radiation sensitive device of claim 1 wherein said device is transparent.

38. The thick, solid, transparent radiation sensitive device of claim 1 wherein said observable change is selected from color change, change in fluorescence, phosphorescence, change in paramagnetic or NMR relaxation rate, when exposed to said radiation, liquid to solid, solid to liquid, or change in transparency.

39. The thick, solid, transparent radiation sensitive device of claim 1 further comprising a UV absorber.

40. The thick, solid, transparent radiation sensitive device of claim 1 further comprising a surfactant.

41. A process of making a thick, solid, transparent radiation sensitive molded or casted shaped polymeric device for monitoring radiation dose prepared by polymerization of at least one monomer or oligomer containing at least one radiation sensitive material capable of developing or undergoing a color, fluorescence, or opacity change when exposed to UV, X-ray, gamma ray, electron, protons, alpha particles or neutron radiation activator.

42. The process of claim 41 wherein said device further comprises at least one of a UV absorber, a convertor, a surfactant and a solvent.

43. A process of making a thick, solid, transparent radiation sensitive molded or casted shaped polymeric device for monitoring radiation dose prepared by solidification of molten polymer containing at least one radiation sensitive material capable of developing or undergoing a color, fluorescence, or opacity change when exposed to radiation.

44. The process of claims 41 or 43 wherein said device has a shape selected from coating, film, fiber, rod, plaque, block, regular shape or irregular shape.

45. The process of claims 41, 43 or 44 wherein said radiation is selected from UV, X-ray, gamma-ray, electrons, protons, alpha particles or neutron radiation.

46. The process of claims 41, 43 or 44 wherein said device further comprises at least one of an activator, a UV absorber, a convertor, a surfactant and a solvent.

47. A process of irradiation of a device of claim 1 with UV, X-ray, gamma ray, electron, protons, alpha particles or neutron radiation thereby producing said observable change in said device.

48. A method for monitoring high energy comprising the step of placing the device of claim 1 in the path of UV, X-ray, gamma ray, electron, protons, alpha particles or neutron radiation and monitoring radiation dose by monitoring said observable change caused by the said radiation.

49. A process of monitoring dose in three dimensions comprising steps of irradiation of the device of claim 1 and scanning said device.

50. A method of imaging and measuring a three-dimensional dose distribution of a radiation source in the device of claim 1 comprising the steps of irradiating said device such that the optical properties are changed upon irradiation, optically scanning the object at various angles, detecting and measuring light projection data indicative of optical changes in the device, calibrating the optical change in the device to the dose of the energy; and mapping the dose of the energy in the object.

51. An optical tomographic scanner for imaging optical properties of device of claim 1 comprising at least one light source for illuminating the device, at least one light detector for measuring light that has interacted with the object, a mechanism that controls the relative motion of the object, the light source or sources, and the light detector or detectors, a tank filled with a liquid in which the object is immersed for refractive index matching, so that the light rays passing through the device are propagated in straight lines; and a computer for controlling the scanner mechanism and for calculating the three dimensional distribution of optical properties inside the object.

52. A method of detecting, measuring and displaying a non-uniform dose of radiation or by forming a visible permanent three dimensional image in said device of claim 1 wherein said three dimensional image is representative of the three dimensional distribution of dose of said radiation to which said device is exposed.

53. Monitoring dose, radiation therapy, sterilization medical supplies or perishables with a device of claim 1.

54. The thick, solid, transparent radiation sensitive device of claim 1 wherein said binder comprises a gel.

55. The thick, solid, transparent radiation sensitive device of claim 1 further comprising water.

56. The thick, solid, transparent radiation sensitive device of claim 54 further comprising an organic liquid.

57. The thick, solid, transparent radiation sensitive device of claim 54 further comprising a mineral oil or paraffin.

58. The thick, solid, transparent radiation sensitive device of claim 54 wherein said binder comprises a water soluble or water swellable polymer.

59. The thick, solid, transparent radiation sensitive device of claim 54 wherein said binder is soluble or swellable in organic solvents.

60. The thick, solid, transparent radiation sensitive device of claim 54 comprising no solvent.

61. The thick, solid, transparent radiation sensitive device of claim 54 wherein said binder comprises a silicone or olefinic polymer.

62. The thick, solid, transparent radiation sensitive device of claim 1 wherein said radiation sensitive material is selected from scintillation material and thermoluminescent material.

63. The thick, solid, transparent radiation sensitive device of claim 62 wherein said scintillation material comprises one of an organic solid, an inorganic crystal or a gas.

64. The thick, solid, transparent radiation sensitive device of claim 63 wherein said organic solid is selected from anthracene, trans-stilbene and naphthalene.

65. The thick, solid, transparent radiation sensitive device of claim 62 wherein said inorganic crystal is selected from Tl activated sodium, Tl activated CsI and BaF₂.

66. The thick, solid, transparent radiation sensitive device of claim 63 wherein said gas comprises at least one gas selected from Xe, Kr, Ar, He or Ne.